Earth's Hydrosphere
ES-5 The student will demonstrate an understanding of Earth's freshwater and ocean systems.

ES-5.2 Illustrate the characteristics of the succession of river systems.
Taxonomy level: 2.2-B Understand Conceptual Knowledge

Previous/future knowledge: Students in 7th grade were introduced to river systems as they studied drainage basins and divides. Students have not been introduced to the concept in this indicator in any previous grade.

It is essential for students to know some of the physical features of the stages of development as a river system forms.

Youthful/Young Rivers:
The condition of the headwater where water first accumulates to form the young river is important as well as stream channel characteristics. The formation of river valleys, along with waterfalls and rapids, also show a youthful river system. The fast-moving water erodes away rock and soil as it moves over steep inclines.

Mature Rivers:
Well-established tributaries and good drainage in the watershed are characteristics of mature rivers. They carry a larger volume of water and form a broader floodplain. The gradient is less steep than a youthful river. A mature river may *meander* across its channel area. Erosion and deposition take place along the river bends. A meander may even be cut off and form an *oxbow lake*.

Old Rivers:
With an even lower gradient, the old river moves slowly. The river channel becomes deeper. It no longer erodes the land. Few tributaries enter as most have already merged into the mature river. A broad flat floodplain is formed. As a river loses velocity when entering a large body of quiet water, the sediment load drops forming a triangular deposit called a *delta.*

Rejuvenation*:*
When the land over which a river is flowing uplifts or if the base level lowers, the stream takes on the features of a young river again; it rejuvenates. Depending upon the rate of water flow, erosion again takes place cutting the river channel.

It is not essential for students to know the types of stream load or how terraces form along rejuvenated rivers. Methods of controlling water along and within river systems and floodplains are also not essential but may offer interesting discussion as to their use as safety measures and their effectiveness.

Assessment Guidelines:
The objective of this indicator is to *illustrate* characteristics of river system succession; therefore, the primary focus of assessment should be to give or use illustrations such as diagrams, pictures, or word descriptions to show different stages of a river system.
In addition to illustrate appropriate assessments may require students to:

- *compare* the stages of river succession;
- *summarize* changes that occur during the succession of a river, or
- *identify* characteristics of a stage in river succession.